

PG&E CASE Report Revise Default EER in ACM

**PG&E Codes and Standards
Enhancement (CASE) Project**

December 17, 2007

Title 24 Committee hearing



**Pacific Gas and
Electric Company**

Codes & Standards Enhancement Project

Federal Air Conditioner Efficiency

- Central Air Conditioners < 65,000 Btu/h
 - Federal efficiency standard “covered” equipment
- Single phase air conditioners and heat pumps manufactured after Jan 2006 at least SEER 13
- SEER – seasonal energy efficiency ratio
- Pre-empted from state regulation

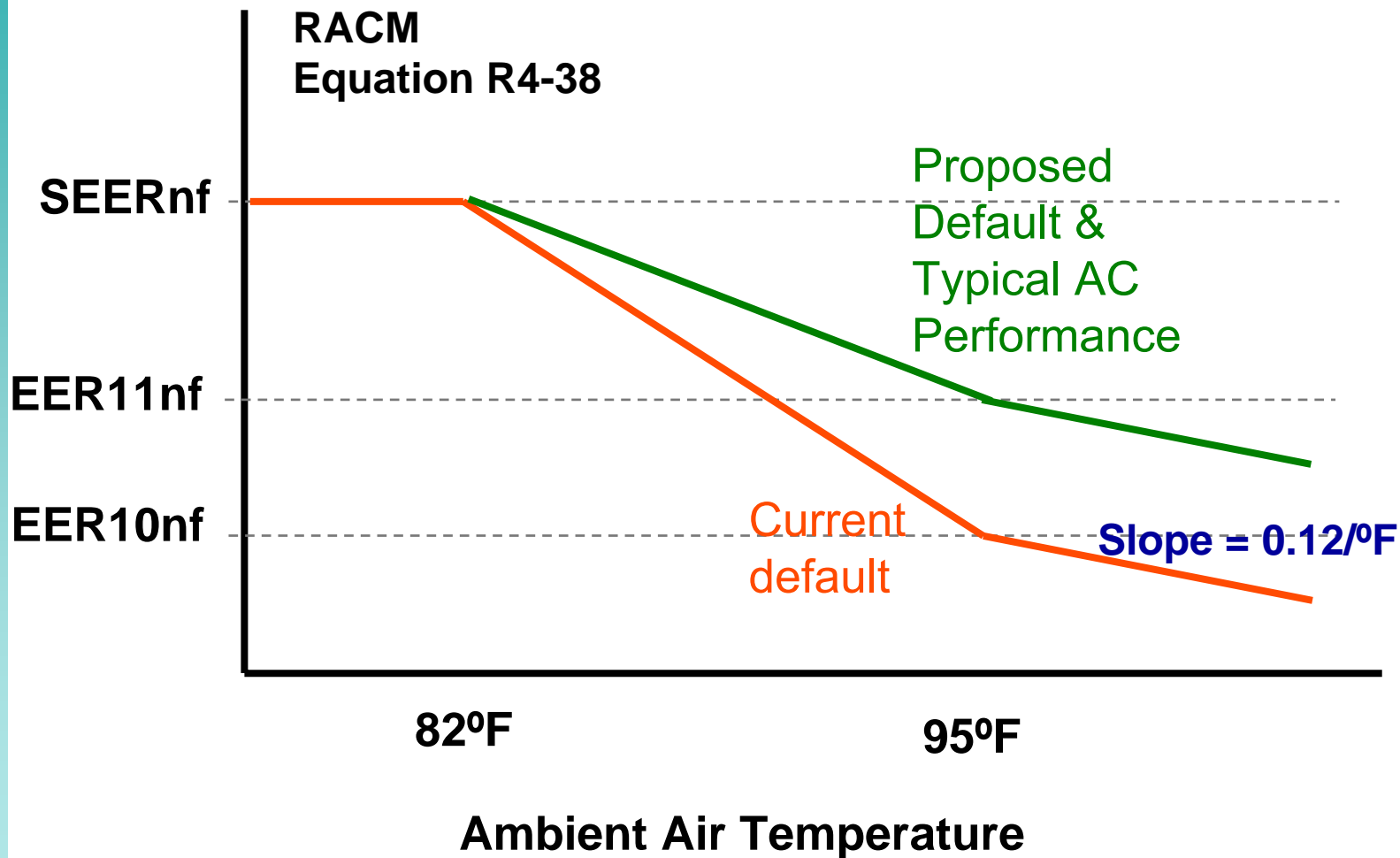


EER vs SEER

- SEER (seasonal energy efficiency ratio) measured at 82°F and under part load
 - Not representative of peak conditions or typical conditions in eastern part of state
- EER (energy efficiency ratio) rated at 95°F ambient temp at full load output
 - Test conditions used to rate capacity of air conditioner
 - Representative of typical conditions in CA hot dry climates in central valley
 - More representative than SEER of peak demand conditions
 - Manufacturer not required to report or label EER



ACM Model of temperature dependent efficiency, EERt



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CEC and ARI databases of SEER 13 central air conditioners

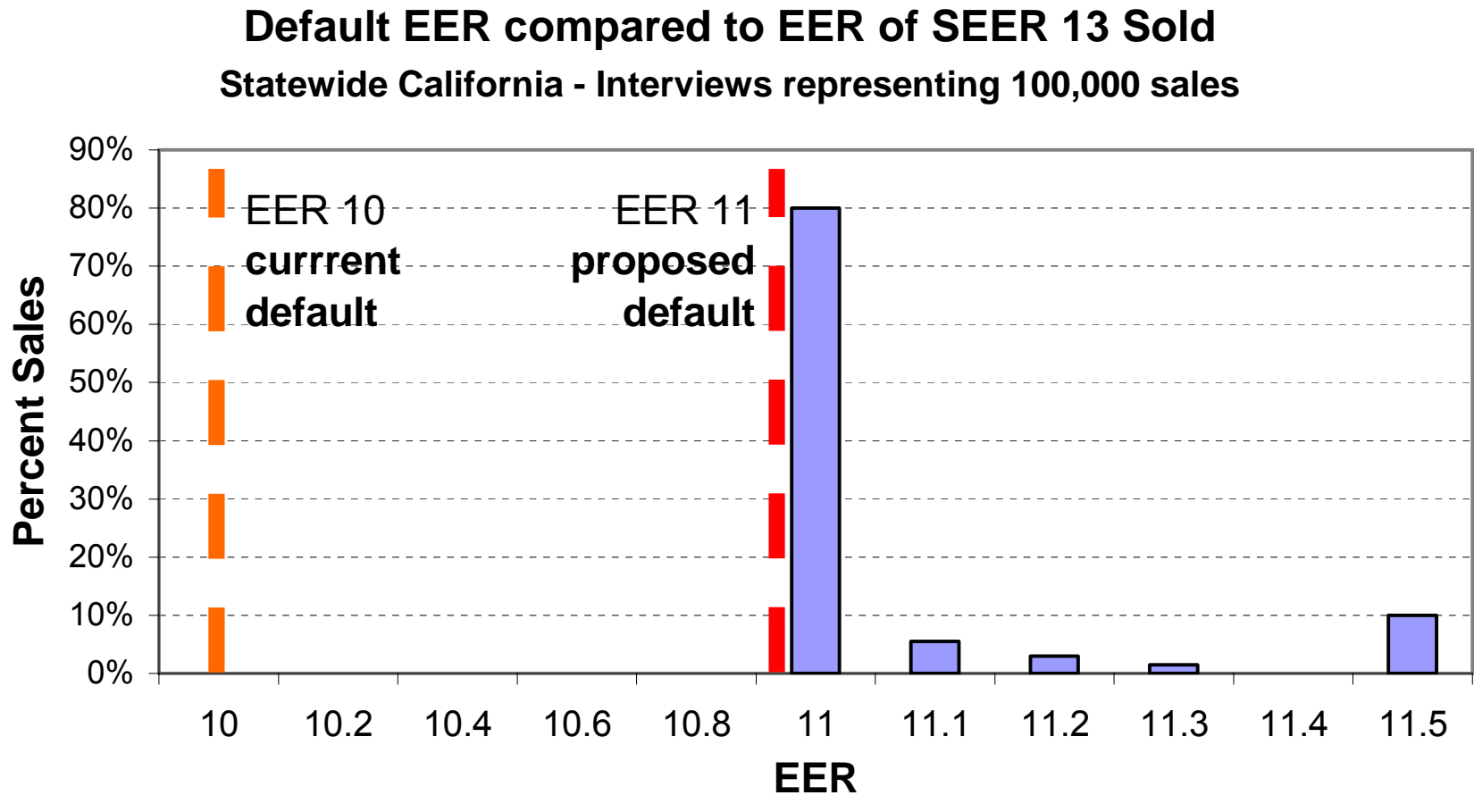
EER Bin	CEC #	CEC % Total	CEC % Cumulative	ARI #	ARI % Total	ARI % Cumulative
Less than 10	0	0.0%	0.0%	148	0.4%	0.4%
10.0 to 10.5	14	1.9%	1.9%	1,141	3.4%	3.8%
10.6 to 10.9	62	8.6%	10.5%	1,997	6.0%	9.8%
11.0 to 11.3	283	39.3%	49.8%	22,516	67.1%	76.9%
11.4 to 11.6	88	12.2%	62.0%	4,178	12.5%	89.4%
11.7 to 11.9	74	10.3%	72.3%	2,587	7.7%	97.1%
12.0 to 12.9	200	27.7%	100.0%	964	2.9%	99.99%
13 and more	0	0.0%	100.0%	3	0.01%	100.0%
Total	721	100%		33,534	100%	

Only 10% of models have EERs less than 11.



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Distribution of EERs for SEER 13 air conditioners sold in CA



No reported sales by largest distributors of equipment < 11 EER.



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Results of Distributor Survey

- Current base case is SEER 13/EER 10
- Contacted distributors on EER sales data
 - Responsible for 100,000 units/yr
- All reported SEER 13 sales are EER 11+
- When a SEER13/EER11 unit is specified and EER verified, **unearned credit is given**
- CTZ 15 - **7% unearned compliance margin**



EER 11 savings and impact on compliance margin by climate

	Single Family Dwelling Savings				
Climate Zone	TDV % Savings	TDV kBtu/sf	TDV kBtu/home	Savings kWh/yr	Peak kW
1	0.00%	0	0	0	0.35
2	1.00%	0.6	1533	36	0.34
3	0.10%	0	57	2	0.36
4	0.20%	0.1	233	4	0.26
5	0.00%	0	16	0	0.25
6	0.00%	0	0	0	0.27
7	0.10%	0	44	1	0.27
8	1.00%	0.4	950	18	0.26
9	2.10%	1	2381	51	0.36
10	3.20%	2	4752	121	0.39
11	3.40%	2.9	7144	156	0.38
12	2.20%	1.5	3613	75	0.34
13	4.10%	3.5	8565	274	0.36
14	3.90%	3.5	8584	227	0.41
15	7.10%	7.6	18499	688	0.42
16	0.40%	0.4	878	17	0.38

EER in ACM



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Statewide **first** year energy savings

- Conservative - assumes only 10% take HERS credit in all climates
 - Only calculated for res, more if include nonres
- Energy 1.6 GWh/yr (2% of total res savings)
- Demand 3.7 MW (12% of total res savings)
- 940 tons/yr CO₂ emissions
- Annual savings 10 times as much at the end of 10 years
- All from a minor change to the ACM



Cost-effectiveness

- This measure does not require a special air conditioner.
 - The minimally compliant air conditioner will still comply
- This measure does not require efficiency levels higher than the prescriptive levels
 - As long as prescriptive requirements are cost-effective, so is this change



Proposed change – Res ACM

- The EER used for calculating the energy consumption of a SEER rated standard central air conditioner shall be the lesser of the EER rating of the air conditioner used in the proposed design or the default EER calculated in Equation R4-41 for the SEER value meeting the Appliance Efficiency Regulations minimum requirements.

- RACM Section 4.7.1 Cooling System Energy

Equation R4-41

- Strike

$$\begin{aligned} &\bullet \text{ ~~SEER} < 11.5 \quad \text{EER} = 10 - (11.5 - \text{SEER}) \times 0.83~~ \\ &\quad \text{~~SEER} \geq 11.5 \quad \text{EER} = 10~~ \end{aligned}$$

- Replace with

$$\begin{aligned} &\bullet \text{ SEER} < 12.7 \quad \text{EER} = 0.455 + \text{SEER} \times 0.83 \\ &\quad \text{SEER} \geq 12.7 \quad \text{EER} = 11.0 \end{aligned}$$



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Proposed Change Nonres ACM

Equation N2-2 EER_{67,95} = From Manufacturer Data [when available]

Strike

~~$$= 10 - (11.5 - SEER) \times 0.83 \quad [\text{default to } SEER < 11.5]$$~~

~~$$= 10 \quad [\text{default to } SEER \geq 11.5]$$~~

Replace with

$$= \frac{0.455 + SEER \times 0.83}{1} \quad [\text{default to } SEER < 12.7]$$

$$= 11 \quad [\text{default to } SEER \geq 12.7]$$



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